

INPUT-OUTPUT ORGANIZATION

Input/Output Subsystem

The I/O subsystem of a computer provides an efficient mode of communication between the central system and the outside environment. It handles all the input-output operations of the computer system.

Peripheral Devices

Input or output devices that are connected to computer are called **peripheral devices**. These devices are designed to read information into or out of the memory unit upon command from the CPU and are considered to be the part of computer system. These devices are also called **peripherals**.

For example: *Keyboards, display units and printers* are common peripheral devices.

There are three types of peripherals:

1. **Input peripherals** : Allows user input, from the outside world to the computer. Example: Keyboard, Mouse etc.
2. **Output peripherals**: Allows information output, from the computer to the outside world. Example: Printer, Monitor etc
3. **Input-Output peripherals**: Allows both input(from outside world to computer) as well as, output(from computer to the outside world). Example: Touch screen etc.

Interfaces

Interface is a shared boundary between two separate components of the computer system which can be used to attach two or more components to the system for communication purposes.

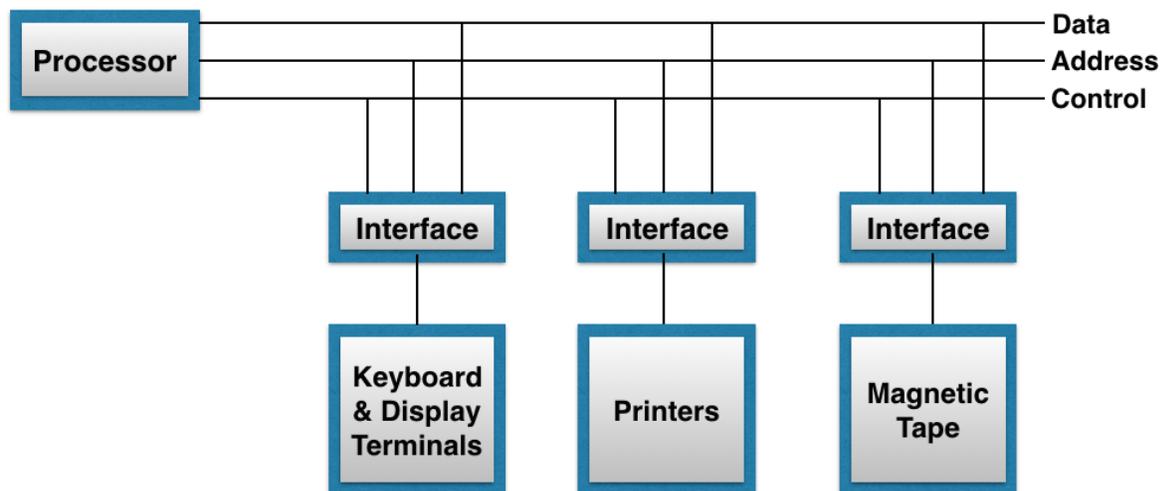
There are two types of interface:

1. CPU Interface
2. I/O Interface

Let's understand the I/O Interface in details,

Input-Output Interface

Peripherals connected to a computer need special communication links for interfacing with CPU. In computer system, there are special hardware components between the CPU and peripherals to control or manage the input-output transfers. These components are called **input-output interface units** because they provide communication links between processor bus and peripherals. They provide a method for transferring information between internal system and input-output devices.



Connection of I/O Bus to I/O Device

The Input/output Interface is required because there are exists many differences between the central computer and each peripheral while transferring information. Some major differences are:

1. Peripherals are electromechanical and electromagnetic devices and their manner of operation is different from the operation of CPU and

memory, which are electronic device. Therefore, a conversion of signal values may be required.

2. The data transfer rate of peripherals is usually slower than the transfer rate of CPU, and consequently a synchronisation mechanism is needed.
3. Data codes and formats in peripherals differ from the word format in the CPU and Memory.
4. The operating modes of peripherals are differ from each other and each must be controlled so as not to disturb the operation of other peripherals connected to CPU.

These differences are resolved through input-output interface. As input-output interface (Interface Unit) contain various components, each of which performs one or more vital function for smooth transforming of information between CPU and Peripherals.

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Input/Output Channels

A channel is an independent hardware component that co-ordinate all I/O to a set of controllers. Computer systems that use I/O channel have special hardware components that handle all I/O operations.

Channels use separate, independent and low cost processors for its functioning which are called Channel Processors.

Channel processors are simple, but contains sufficient memory to handle all I/O tasks. When I/O transfer is complete or an error is detected, the channel controller communicates with the CPU using an interrupt, and informs CPU about the error or the task completion.

Each channel supports one or more controllers or devices. **Channel programs** contain list of commands to the channel itself and for various connected controllers or devices. Once the operating system has prepared a list of I/O commands, it executes a single I/O machine instruction to initiate the channel program, the channel then assumes control of the I/O operations until they are completed.

IBM 370 I/O Channel

The I/O processor in the IBM 370 computer is called a **Channel**. A computer system configuration includes a number of channels which are connected to one or more I/O devices.

Categories of I/O Channels

Following are the different categories of I/O channels:

Multiplexer

The Multiplexer channel can be connected to a number of slow and medium speed devices. It is capable of operating number of I/O devices simultaneously.

Selector

This channel can handle only one I/O operation at a time and is used to control one high speed device at a time.

Block-Multiplexer

It combines the features of both multiplexer and selector channels.

The CPU directly can communicate with the channels through control lines. Following diagram shows the word format of channel operation.



Input/Output Instruction Format

